below zero, at Hamilton on the 30th. The average precipitation was 0.29, or 0.30 below normal; the greatest monthly amount, 0.78, occurred at Forman, and the least, trace, at Ashley, Coal Harbor, Ellendale, Glenullin, Larimore, and Steele.—*B. H. Bronson.*

Ohio.—The mean temperature was 27.8°, or nearly normal; the highest was 66°, at Portsmouth on the 4th, and the lowest, 15° below zero, at Colebrook and Garrettsville on the 31st. The average precipitation was 3.01, or nearly normal; the greatest monthly amount, 6.53, occurred at Hanging Rock, and the least, 1.44, at Annapolis.—*J. Warren Smith.*

Oregon.—The mean temperature was 38.6°, or 3.6° above normal; the highest was 78°, at Langlois on the 25th, and the lowest, 10° below zero, at Weston on the 3d. The average precipitation was 6.49, or 0.37 above normal; the greatest monthly amount, 30.08, occurred at Glenora, and the least, 0.23, at Prineville.—*B. S. Pague.*

Pennsylvania.—The mean temperature was 26.6°, or 1.4° below normal; the highest was 66°, at Pittsburg on the 4th, and at Lycippus on the 5th, and the lowest, 21° below zero, at Dushore on the 2d. The average precipitation was 3.05, or 0.15 below normal; the greatest monthly amount, 4.84, occurred at Browers Lock, and the least, 0.82, at Franklin.—*T. F. Townsend.*

South Carolina.—The mean temperature was 44.4°, or 1.6° below normal; the highest was 78°, at Gillisonville on the 6th, and the lowest, 17°, at Little Mountain on the 2d and at Walhalla on the 7th. The average precipitation was 4.72, or 0.37 above normal; the greatest monthly amount, 6.75, occurred at Holland, and the least, 2.84 at Charleston.—*J. W. Bauer.*

South Dakota.—The mean temperature was 15.0°, or about 4.0° above normal; the highest was 68°, at Desmet on the 24th, and the lowest, 32° below zero, at Wessington Springs on the 30th. The average precipitation was 0.40, or 0.28 below normal; the greatest monthly amount, 2.65, occurred at Rochford, and the least, trace, at Forestburg, Gannvalley, and Wessington Springs.—*S. W. Glenn.*

Tennessee.—The mean temperature was 38.3°, or slightly above normal; the highest was 72°, at Jackson on the 4th, and the lowest, 2° below zero, at Madison on the 31st. The average precipitation was 6.02, or nearly 1.00 above normal; the greatest monthly amount, 8.75, occurred at Union City, and the least, 2.06, at Silverlake.—*H. C. Bate.*

Texas.—The mean temperature for the State, determined by comparison of 41 stations, well distributed throughout the State, was 1.8° below the normal; the temperature was nearly normal along the coast, while there was a general deficiency over the interior; maximum, 91° at Fort Ringgold on the 21st; minimum, 3° below zero at Amarillo on the 31st. The average precipitation for the State, determined by comparison of 51 stations, distributed throughout the State, was 0.32 below the normal; there was a deficiency ranging from 1.00 to 2.38 over central Texas, the eastern portion of southwest Texas and the extreme western portion of the coast district, while there was an excess generally elsewhere, which, however, was light except along the east coast, where the excess ranged from 1.83 to 6.70, the greatest being at Galveston. The rainfall at Galveston, 10.39, is the heaviest on record for the month of January since the opening of the station in 1871. The weather was generally favorable for wheat. Too much rain over the east coast injured strawberry plants and retarded garden work.—*I. M. Cline.*

Utah.—The mean temperature was 27.7°; the highest was 70°, at St. George on the 27th, and the lowest, 21° below zero, at Woodruff on the 10th. The average precipitation was 1.14; the greatest monthly amount, 3.96, occurred at Huntsville, and the least, 0.10, at Frisco and Grove.—*L. H. Murdoch.*

Virginia.—The mean temperature was 35.5°, or 1.4° below normal; the highest was 75°, at Sunbeam on the 6th, and the lowest, 12° below zero, at Woodstock on the 2d. The average precipitation was 3.36, or 1.02 below normal; the greatest monthly amount, 5.34, occurred at Warrenton, and the least, 1.31, at Stephens City.—*E. A. Evans.*

Washington.—The mean temperature was 34.4°, or nearly normal; the highest was 66°, at Waterville on the 27th, and the lowest, 36° below zero, at Usk on the 6th. The average precipitation was 7.36, or about 2.00 above normal; the greatest monthly amount, 24.28, occurred at Clearwater, and the least, 1.29, at Loomis.—*G. N. Salisbury.*

Wisconsin.—The mean temperature was 13.9°, or nearly normal; the highest was 52°, at Prairie du Chien on the 26th, and the lowest, 46° below zero, at Osceola on the 29th. The average precipitation was 0.86, or 0.23 below normal; the greatest monthly amount, 1.70, occurred at Shawano, and the least, 0.15, at Brodhead —*W. M. Wilson.*

Wyoming.—The mean temperature was 22.7°, or slightly above normal; the highest was 60°, at Hecla on the 10th and at Sundance on the 13th and 18th, and the lowest was 21° below zero, at Sheridan on the 5th. The average precipitation was 1.50, or about 0.75 above normal; the greatest monthly amount, 6.40, occurred at Sherman, and the least, 0.10, at Wamsutter.—*W. S. Palmer.*

SPECIAL CONTRIBUTIONS.

LIST OF RECENT TITLES OF PAPERS BEARING ON METEOROLOGY.

W. F. R. PHILLIPS, in charge of Library, etc.

The subjoined list of titles has been selected from the contents of the periodicals and serials recently received in the library of the Weather Bureau. The titles selected are of papers or other communications bearing on meteorology or cognate branches of science. This is not a complete index of the meteorological contents of all the journals from which it has been compiled; it shows only the articles that appear to the compiler likely to be of particular interest in connection with the work of the Weather Bureau:

Naturwissenschaftliche Rundschau, Braunschweig, 14 Jahrgang.
Trabert, Wilh. Der Zusammenhang zwischen den Erscheinungen des Erdmagnetismus und den elektrischen Vorgängen in der Atmosphäre, p. 41. [From Metl. Zeit.]

Comptes Rendus, Paris, Tome 128.
Berthelot. Sur la marche générale de la végétation; plante développée à l'ombre et au soleil; regain. p. 139.
Poincare, M. A. Movements barométriques sur l'orthogonal du méridien de la Lune. p. 328.
Tillo, A. de. Résultats des observations météorologiques faites dans la dépression au centre du continent asiatique, (station Lukishoun). p. 154.
Voielland, M. Chute de grële et trombe observées à Bizerte. p. 327.

Nature, London, Vol. 59.
MacMahon, P. A. Mirage. p. 259.

Das Wetter, Berlin, Jan. 1899.
Arendt, Theodor. Ueber die Zunahme der Blitzgefahr. p. 1.
———Zum Polarlicht, vom 9, September, 1898. p. 20.
Mienardus, Wilh. Der mitteleuropäische Winter und seine Beziehungen zum Golfstrom. p. 8.
Plumandon. J. R. Der Regen. p. 14. [From Ciel et Terre.]

Petermann's Mitteilungen, Gotha, 45 Band.
Supan, A. Vertikale Temperaturabnahme in der freien Atmosphäre. p. 19.

Ciel et Terre, Bruxelles, 19me. année.
Bentley, W. A., Perkins, G. H. Les cristaux de la neige. p. 543. [From Appletons Popular Science Monthly.]
Lancaster, A. La gelée et les anticyclones. p. 579.
Moye, M. Les étoiles filantes et la météorologie. p. 526.
Ramsey, A. La théorie cinétique des gaz et quelques-unes de ses conséquences. p. 513, also p. 571.
St. Hepites. Météorologie de l'Etna. p. 563.

Annales de Géographie, Paris, 1899.
Martonne, E. de. Sur un nouveau mode de représentation du régime des pluies dans les contrées intertropicales. p. 84.

Appleton's Popular Science Monthly, New York. Vol. 54.
Smith, Stephen. Vegetation a Remedy for the Summer Heat of Cities. p. 433.

National Geographic Magazine, Washington, Vol. 10.
Garriott, E. B. West India Hurricane of September 10–11, 1898. p. 17.

Philosophical Magazine, London, Vol. 47.
van Rijckevorsel. On the Analogy of some Irregularities in the Yearly Range of Meteorological and Magnetic Phenomena. p. 57.

Journal of School Geography, Lancaster, Vol. 3.
Fenneman, N. M. Climate of the Great Plains. p. 1, also p. 46.

Aeronautical Journal, London, Vol. 3.
Eddy, W. A. Some Kite Records in the United States. p. 15.
Hazen, H. A. Glaisher's Highest Balloon Ascension. p. 13.
Rotch, A. L. Progress in the Exploration of the Air with Kites at the Blue Hill Observatory. p. 17.

Scottish Geographical Magazine, Edinburgh, Vol. 14.
Newell, F. H. The Hydrography of the United States. p. 9.

Engineering News, New York, Vol. 41.
———The Mississippi River Floods and Methods for their Control. 5. 50. [Abstract of report of the Committee on Commerce, U. S. Senate.]
Lippincott, J. B. Low Water Measurements in the State of California during the Summer of 1898. p. 12.

HINTS TO OBSERVERS OF SHOOTING STARS.

By WILLIAM HARKNESS, Professor, U. S. Navy.

The star showers of November and other months attract

very general attention, and doubtless there are many persons scattered over the country who would gladly cooperate in observing them if they only knew how, the more especially as no expensive instruments are required, and the amount of astronomical knowledge demanded is very slight. For this reason it seems not inappropriate to specify here the apparatus required and the points to which attention should be directed.

The position selected from which to make the observations should have the horizon, in every direction, as free and unobstructed as possible. The apparatus requisite is as follows: A map of the stars in the vicinity of the radiant point. For this purpose a special map prepared by the U. S. Naval Observatory will be the most suitable; but if such a one is not to be obtained, any school celestial atlas—Burritt's, for instance—will answer perfectly well.

A lantern, or a lamp, so placed that while it is protected from the wind it will be in a convenient position to throw light on the star map.

A well-regulated watch. The error of the watch on local mean time[1] should be ascertained as accurately as possible, and if the time is to be used for the identification of the meteors when they are numerous, it will be necessary that it should be known to within one or two seconds. In all cases it should be stated how the error of the watch was obtained. However, let no one give up the idea of observing because he is not certain of the exact error of his watch. The observations may still be very valuable even if the recorded times are all erroneous by a constant quantity.

At the head of the sheet containing the observations should be given the date and the name of the place where they were made, together with the name of the county and State. Then for each meteor the following particulars should be recorded:

1. The hour, minute, and second at which it was seen. If many meteors are to be observed, it will be necessary to have an assistant whose sole business it will be to note the time at a preconcerted signal from the observer, so that the observer himself may devote all his attention to accurately determining the paths.

2. Its apparent size. If it is small, it may be stated that it appeared of the same size as a first, second, third, or fourth magnitude star, as the case may be; or of the same size as some particular star which is named. Larger meteors may be compared with Jupiter, Venus, or the Moon, by stating, for example, that they are half, one-third, or one-quarter as large; or their apparent diameter in minutes may be given, the Moon being used as a standard of measurement, and it being borne in mind that she is about thirty minutes in diameter.

3. Its color.

4. Its duration—that is, the length of time during which it was visible. If the observer be provided with a stop watch he will find it exceedingly convenient for this purpose, as it will only be necessary to start the second hand when the meteor appears and to stop it when it disappears in order to have the exact duration of its visibility. Unfortunately stop watches are rare, and other means will generally have to be resorted to. Probably counting the beats of a common watch or clock will be found the most available. At first the observer will be almost certain to overestimate the time of visibility, but after a little practice he will find that it is exceedingly short—for ordinary shooting stars less than half a second.

5. The position or altitude and azimuth of the point where it first became visible. This is best ascertained by noting carefully the position of the point in question relatively to the neighboring stars, and then, having found the same stars on the celestial map, it can be marked there in the same relative position to them and its right ascension and declination read off from the lines engraved on the map for that purpose. If the observer have no celestial maps and is unacquainted with the stars, then the only thing that he can do will be to note as carefully and accurately as possible the direction (as north, northeast, etc.) and altitude above the horizon of the point where the meteor first made its appearance. The best way for an unpractised observer to estimate altitudes will be for him to imagine the distance between the zenith and horizon divided into eight equal parts and then to state how many of these parts the object appeared above the horizon. Such observations will always be rough at the best, but still they are better than none.

6. Appearance; train, if any, and its duration. Give a minute description of anything peculiar about the meteor or its tail if it had one. If it was only an ordinary shooting star it must be so stated. If it left a luminous track, that should be mentioned, and also whether the track remained fixed in the sky till it gradually faded out or whether it appeared to undulate and float away. It should also be stated whether the track was a continuous streak of light or seemed to be composed of small sparks. It is always best to make a sketch of all large meteors, even if it is a rough one, as soon after seeing them as possible.

7. Length of path. It is better not to attempt to estimate this directly, as it can be much more satisfactorily ascertained by measuring on a celestial globe the distance between the points of appearance and disappearance of the meteor. However, if the point of disappearance is not otherwise noted the length of path must be stated as accurately as possible.

8. Direction; noting also whether horizontal, perpendicular, or inclined. State the direction in which the meteor moved, as, for example, from north to west; also whether the track was parallel to the horizon or inclined. If it was inclined, a very convenient way of estimating the amount of inclination will be to hold a watch with its face toward the meteor's path and with the twelve-hour mark vertical. Then, imagining the path to pass through the center on which the hands turn, state what hour and fraction of an hour it would pass through on the circumference.

9. Insert any remarks that may be necessary concerning points which have not been noted under the preceding heads.

10. At the close of the observations give the observer's name and title in full.

The above instructions are perfectly general, and are intended to apply to all observers, whether provided with star maps or not, and to all meteors, whether large or small. In order to adapt them to particular cases, it will be necessary to modify them somewhat.

If the observer is provided with star maps, then, instead of making the observations described under paragraphs 7 and 8, it will be much better for him to note the point of disappearance of the meteor among the neighboring stars, in the same way as is described at the beginning of paragraph 5 for its appearance. The points of beginning and ending of the track being noted in this manner, of course both the length and direction of the track are also known. The plan pursued at the United States Naval Observatory for recording the tracks of meteors is as follows: Each officer is provided with a suitable star map. When he sees a meteor he observes carefully its path among the stars and at once, turning to his map, he finds the same stars on it and draws the track in pencil in the same relative position to them that it occupied in the heavens. The right ascension and declination of the beginning and end of each track is subsequently read off from the map and tabulated.

In the case of a large meteor, of course the description will embrace all the particulars mentioned above; but if the me-

[1] NOTE.—The seventy-fifth meridian time can be obtained from any telegraph office.—ED.

teors are small and numerous, it will plainly be impossible to describe each one so minutely. Then it will be best to trace on a map as many of their tracks as possible, note the time of appearance of each, and give a general account of the shower, including all the points mentioned above. It will also be necessary to state the time of beginning and ending of the shower, and the time when it reached its height. This can best be determined by counting and recording the number of meteors that fall in each consecutive ten minutes.

Whenever meteors are numerous, it will be noticed that if we imagine their tracks to be produced backwards in the heavens they will all intersect at a common point. This is the radiant point, and its exact position is of such great importance that no observer should fail to determine it as accurately as possible.

The principal meteoric showers take place annually on the nights of the 9th, 10th, and 11th of August, and of the 12th or 13th of November. The August shower never attains the brilliancy which is sometimes displayed by the November one, but it is much more certain in its recurrence. Its radiant point is in the vicinity of the star β Camelopardali, while that of the November meteors is near the star γ Leonis. The nights which have just been mentioned are those on which it is most important to be on the watch for meteors. Nevertheless, they appear in greater or less numbers during almost every clear night, and as good observations of them are always valuable, the observer may rest assured that time so employed is never thrown away.

RECORDS BY THE KITE CORPS AT BAYONNE, N. J.

On page 161 of the MONTHLY WEATHER REVIEW for April, 1898, Mr. Allen communicated the results of 23 kite ascensions.

In the following table the records for ascensions Nos. 23–60 are given, bringing the record down to January 2, 1899. Mr. A. J. Henry has added the temperatures and winds from self-registers from New York City. At the beginning of the series the Weather Bureau thermometer in New York was 298 feet above ground and 314 above sea level, but on October 15, 1898, the instruments were moved to an adjacent building, and the new altitude of the thermometer is 313 feet above the ground and 350 feet above sea level. With regard to his own later observations Mr. Allen says:

I enclose a list of thermometer ascensions, Nos. 23 to 60, in continuation of those published by you in April, 1898. I have noted those ascensions made with the use of piano wire, of which the Bayonne Kite Corps has over 4,000 feet and is preparing to get more.

During November, December, and January I could not take more records, owing to the weather not being suitable for kiteflying and urgent calls upon my time, but I am hoping to begin regular ascensions soon. * * * Ascension No. 23 was the first made with piano wire.

For further details the reader is referred to the previous article in the April REVIEW.

It appears that Messrs. W. W. Hotchkins, Henry L. Allen, and William H. Mitchell organized themselves into the Bayonne Kite Corps on April 16, 1898, and that the home station is at Bergen Point. This step bespeaks a permanent interest in kiteflying for meteorological purposes that augers well for the future. It is to be hoped that larger kites with the Marvin meteorograph may eventually be brought into use at Bergen Point, Bayonne, N. J.

OBSERVATIONS AT RIVAS, NICARAGUA.

The records contributed for many years by Dr. Earl Flint, at Rivas, Nicaragua, include barometric readings. His present station is at 11° 26′ N., 85° 47′ W. The observations at 7:17 a. m., local time are simultaneous with Greenwich 1 p. m. The altitude of his barometer is 36 meters above sea level, but until the barometer has been compared with a standard it seems hardly necessary to publish the daily readings. The wind force is recorded on the Beaufort scale, 0–12. When cloudiness is less than $\frac{1}{10}$, the letter "F," or "Few," is recorded.

Thermometer ascensions made at Bergen Point, Bayonne, N. J., by the Bayonne kite corps.

Number.	Ascension. Date.	Ascension. P. M. Began.	Ascension. P. M. Ended.	Kite record. Altitude.	Kite record. Temperature. Max.	Kite record. Temperature. Min.	Local conditions. Temperature. Beginning.	Local conditions. Temperature. Ending.	Local conditions. Wind.	Local conditions. Sky.	New York. Temperature. Beginning.	New York. Temperature. Ending.	New York. Winds during ascensions. Direction.	New York. Winds during ascensions. Velocity.	Average daily temperature observed by Mr. Eadie, at Bayonne, N. J. Same day.	Second day.	Third day.
1	2	3 H. M.	4 H. M.	5 Feet.	6 °	7 °	8 °	9 °	10	11	12 °	13 °	14	15 Miles.	16 °	17 °	18 °
23	April 30, 1898	9 15	10 00	370*	59	56	56	57	wnw.	Clear to cloudy.	62	60	nw.	8	58.5	61.5	56.5
24	May 14, 1898	8 35	10 00	400*	59	56	59	55	ssw.	Partly cloudy.	60	59	s.	7	61	55	56.5
25	May 31, 1898	7 40	8 30	200	70	68	68	68	nne.	Partly cloudy.	73	69	ne.	5	68.5	70	64.5
26	June 10, 1898	7 25	7 45	300	79	76	79	76	sw.	Cloudy.	63	62	se.	9	70	67.5	79
27	June 10, 1898	8 40	9 45	275	76	70	76	72	sw.	Partly cloudy.	61	60	se.	8	70	67.5	79
28	June 14, 1898	8 30	9 30	500	81	76	81	70	w.	Partly cloudy.	79	78	w.	8	78.5	76	62.5
29	June 20, 1898	9 00	9 50	200	73	64	72	65	wsw.	Partly cloudy.	69	68	sw.	12	68.5	66	64
30	July 8, 1898	7 50	8 15	300	80	78	80	79	sw.	Cloudy.	81	80	sw.	14	74.5	77	71
31	July 12, 1898	9 00	9 30	250 300	69	66	69	68	ne.	Cloudy.	66	66	ne.	18	66	64	74.5
32	July 14, 1898	8 55	9 45	500	73	72	73	73	sw.	Cloudy.	74	73	sw.	15	74.5	82	77.5
33	July 16, 1898	8 50	10 45	250	74	70	74	65	sw.	Partly cloudy.	76	73	w.	7	77.5	73.5	75
34	July 22, 1898	9 40	10 10	400	73	68	72	72	e.	Cloudy.	70	69	e.	10	76	70.5	74
35	July 23, 1898	4 30	5 50	200	73	68	73	71	se.	Cloudy.	72	70	se.	7	70.5	74	73.5
36	July 25, 1898	3 40	5 30	1,541*	78	71	78	74	se. to s.	Cloudy, clearing.	73	72	se.	13	73.5	77	75
37	July 27, 1898	11 53†	12 25†	375	78	74	78	78	ne.	Cloudy.	74	75	ne.	6	75	76	84
38	July 27, 1898	4 15	4 35	325	75	73	78	75	e. to se.	Cloudy.	77	76	e.	6	75	76	84
39	July 29, 1898	10 43†	11 20†	350	84	80	82	85	sw.	Partly cloudy.	78	79	w.	8	84	85.5	82
40	August 5, 1898	8 00	9 00	375	77	68	77	70	wsw.	Clear.	77	75	w.	13	76.5	76.5	78.5
41	August 6, 1898	8 45	9 35	500*	77	70	72	71	sw.	Partly cloudy.	76	75	w.	14	76.5	78.5	82.5
42	August 13, 1898	4 20	5 00	500	76	74	76	75	nw.	Partly cloudy.	76	76	nw.	7	73.5	71.5	73.5
43	August 25, 1898	7 20	7 35	325	78	75	76	76	sw.	Partly cloudy.	80	80	sw.	24	79.5	74.5	71.5
44	August 30, 1898	7 15	7 33	300	80	77	78	78	sw.	Clear.	81	80	sw.	17	80	83.5	86.5
45	August 30, 1898	8 00	8 20	300	79	77	78	78	sw.	Clear.	80	79	sw.	15	80	83.5	86.5
46	September 5, 1898	2 32	5 04	600*	90	84	88	85	sw.	Partly cloudy.	84	85	s.	11	85	83.5	78
47	September 8, 1898	8 05	9 05	500	61	58	61	61	s.	Clear.	65	65	s.	8	70.5	70	70
48	September 10, 1898	5 15	5 48	500	73	66	73	68	ne.	Partly cloudy.	72	70	n.	18	70	64	65.5
49	September 16, 1898	7 52	8 26	500	68	66	67	67	s.	Partly cloudy.	67	67	s	11	73	77	78.5
‡50	September 19, 1898	7 57	8 40	300	74	70	72	70	nw.	Clear.	75	72	nw.	10	75	64	58.5
	September 19, 1898	8 02	8 37	280	75	70	72	70	nw.	Clear.	74	73	nw.	8	75	64	58.5
‡51	September 24, 1898	9 16	10 22	500	58	51	58	55	ne.	Cloudy.	54	53	ne.	12	64.5	55	68.5
	September 24, 1898	9 22	10 30	475	58	53	58	55	ne.	Cloudy.	54	53	ne.	12	64.5	55	68.5
52	September 28, 1898	7 31	9 00	500	67	60	62	59	sw.	Clear.	69	66	sw.	8	66	67	70
53	October 8, 1898	5 45	6 08	500	65	62	65	64	wsw.	P. cloudy to cl'dy.	65	64	w.	10	61.5	63	56
54	October 8, 1898	9 20	11 07	1,100*	64	55	64	55	nw.	Partly cloudy.	63	59	nw.	9	61.5	63	56
55	October 22, 1898	7 30	8 07	300	54	48	54	51	wsw.	Partly cloudy.	54	53	ne.	30	63.5	52	53
56	October 22, 1898	8 15	8 47	300	50	48	50	48	wsw.	Partly cloudy.	53	50	ne.	30	63.5	52	53
57	October 29, 1898	4 55	5 25	300	49	46	49	47	ne.	Cloudy.	51	51	ne.	6	44.5	46.5	50.5
58	October 29, 1898	9 00	9 40	300	47	45	47	46	ne.	Cloudy.	50	50	ne.	7	44.5	46.5	50.5
59	November 12, 1898	8 00	8 30	400	40	38	38	38	wsw.	Clear to p. cl'dy.	43	42	w.	4	41	40	47
60	January 2, 1899	12 57	4 12	1,095*	22	10	22	16	sw.	P. cloudy to clear.	14	17	w.	10	12	20	36

*Piano wire used. †A. M. ‡Ascensions Nos. 50 and 51—two thermometers on same kite line.